Abstract Submitted
for the TSF05 Meeting of
The American Physical Society

Bohmian Interpretation of Quantum Mechanics and Ehrenfest's Theorem for Energy[1] DONALD KOBE, University of North Texas — The Bohmian causal interpretation of quantum mechanics uses the wave function in polar form in the Schroedinger equation to obtain a Hamilton-Jacobi equation with a quantum potential and an equation of continuity. From the Hamilton-Jacobi equation Newton's second law is obtained with a quantum force. Quantum trajectories are determined by the classical forces and quantum force. The energy of a system of charged particles in an electromagnetic field is the sum of kinetic energy, conservative potential energy, and the quantum potential. The time derivative of the energy for this nonconservative system is the power supplied by the nonconservative electric field and a quantum power. When this equation is averaged over the probability density, the average of the quantum power is shown to be zero. This average equation is equivalent to Ehrenfest's theorem for energy, which states that the time derivative of the expectation value of the energy operator is equal to the expectation value of the power operator. Therefore, for the energy the Bohmian interpretation is equivalent to standard quantum mechanics.

[1]I thank Drs. Y. Zheng, W. P. Schleich, and M. O. Scully for helpful discussions. Supported in part by grant ONR N00014-03-1-0639/TAMU TEES 53494.

Donald Kobe
University of North Texas

Date submitted: 13 Sep 2005

Electronic form version 1.4